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The posteromedial thigh flap for head and Neck reconstruction: anatomical basis, surgical technique, and clinical applications

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Abstract: **BACKGROUND:** The authors present the posteromedial thigh flap as an alternative source for head and neck reconstruction, and the perforator patterns and vascular anatomy of this flap were further investigated. **METHODS:** From March to August of 2014, 23 patients underwent head and neck reconstruction with 23 posteromedial thigh flaps. The numbers, locations, and types of perforators were measured. The surgical technique and the results after reconstruction were evaluated. **RESULTS:** Most perforators were located 8 to 10 cm away from the pubic crease on the reference line between the perineum and the insertion of the semitendinosus muscle. The average number of perforators was 1.7 (range, 1 to 3), and the average pedicle length was 10.3 cm (range, 8 to 13 cm). Eighty percent of the perforators (32 of 40) were musculocutaneous, and 20 percent (8 of 40) were septocutaneous. Ninety-five percent of the perforators (38 of 40) originated from the profunda femoris artery, and 5 percent (two of 40) originated from the medial circumflex femoral artery. The flap survival rate was 95.6 percent; one flap failed due to pedicle thrombosis. The donor sites were all closed primarily. **CONCLUSIONS:** The location of the perforators of the posteromedial thigh flap is consistent, and the pedicle length is sufficient to reach the neck region. Different reconstruction demands can be met by incorporating various soft-tissue components. The donor-site scar is well concealed, with minimal morbidity. The above advantages make the posteromedial thigh flap an excellent option for head and neck reconstruction. **CLINICAL QUESTION/LEVEL OF EVIDENCE:** Therapeutic, IV.

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The Posteromedial Thigh Flap for Head and Neck Reconstruction: Anatomical Basis, Surgical Technique, and Clinical Applications

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Background: The authors present the posteromedial thigh flap as an alternative source for head and neck reconstruction, and the perforator patterns and vascular anatomy of this flap were further investigated.

Methods: From March to August of 2014, 23 patients underwent head and neck reconstruction with 23 posteromedial thigh flaps. The numbers, locations, and types of perforators were measured. The surgical technique and the results after reconstruction were evaluated.

Results: Most perforators were located 8 to 10 cm away from the pubic crease on the reference line between the perineum and the insertion of the semitendinosus muscle. The average number of perforators was 1.7 (range, 1 to 3), and the average pedicle length was 10.3 cm (range, 8 to 13 cm). Eighty percent of the perforators (32 of 40) were musculocutaneous, and 20 percent (8 of 40) were septocutaneous. Ninety-five percent of the perforators (38 of 40) originated from the profunda femoris artery, and 5 percent (two of 40) originated from the medial circumflex femoral artery. The flap survival rate was 95.6 percent; one flap failed due to pedicle thrombosis. The donor sites were all closed primarily.

Conclusions: The location of the perforators of the posteromedial thigh flap is consistent, and the pedicle length is sufficient to reach the neck region. Different reconstruction demands can be met by incorporating various soft-tissue components. The donor-site scar is well concealed, with minimal morbidity. The above advantages make the posteromedial thigh flap an excellent option for head and neck reconstruction. (*Plast. Reconstr. Surg.* 136: 363, 2015.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

Free flap surgery has become a popular procedure for head and neck reconstruction.¹ Large, well-vascularized tissue can be transferred to achieve both functional and aesthetic reconstruction, with superior success rates. Numerous soft-tissue flaps have been reported for head and neck reconstruction, and perforator flaps in particular have gained popularity because of their ability to preserve the underlying muscle and minimize donor-site morbidity. Although various anatomical regions of the body can be selected as flap donor sites, the lower extremities are popular for head and neck reconstruction.²⁻⁹

However, the posterior medial thigh region has been neglected as a potential donor site for head and neck reconstruction; skin flaps in this area were first reported in 1947 by Conway and Griffith¹⁰ and Conway and Kraissl.¹¹ Later, Angri-giani et al. performed cadaver studies evaluating the skin flaps of the posterior medial thigh region

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based on proximal musculocutaneous perforators from the adductor magnus muscle.¹² The donor artery was the first medial branch of the profunda femoris artery, and the related flap was named the “adductor flap.” However, although the profunda femoris artery is the main source artery of the posterior medial thigh region, the following arteries also supply this area: medial circumflex femoral artery, pudendal artery, perforators from the semimembranosus and semitendinosus muscles, and inferior gluteal artery.¹² The clinical application of skin flaps from the posterior medial thigh region was most often used for ischial pressure sore reconstruction.^{12–15} Allen et al. reported the profunda artery perforator flap for autologous breast reconstruction when abdominal tissue was not available and, recently, the posterior medial thigh flap has been described as a free flap for breast reconstruction.^{16–18}

To our knowledge, there is a paucity of data describing the clinical application of this flap for head and neck reconstruction. In this article, we report our experience in using the posteromedial thigh flap for head and neck reconstruction and describe the perforator patterns, flap design, and dissection technique; we also discuss its clinical indications and the advantages and versatility of this flap compared with the conventional lower extremity perforator flaps.

PATIENTS AND METHODS

From March to August of 2014, posteromedial thigh flap surgery was performed in 23 patients to reconstruct head and neck defects. The patient group included 21 male and two female patients. The baseline data of these 23 patients are summarized in Table 1. The average age of the patients was 56.7 years (range, 36 to 79 years). The defects were all caused by cancer ablation, except for one patient, who was undergoing release scar contracture of the neck. Defect locations included the buccal area ($n = 6$), tongue ($n = 6$), lower gum ($n = 3$), hard palate ($n = 2$), hypopharynx ($n = 2$), lower lip ($n = 1$), oropharynx ($n = 1$), cheek ($n = 1$) and neck ($n = 1$). The location of the perforators was determined preoperatively by computed tomographic angiography and confirmed with hand-held Doppler. Computed tomographic angiography was performed in the first seven consecutive patients. A perforator size of more than 1 mm was considered sizable. In every case, the number and location of skin perforators from the posterior medial thigh, the flap dimensions, the flap harvest time, the pedicle length,

and the vascular diameter were recorded, as were the flap success, flap complications (i.e., failure, partial necrosis, infection, dehiscence, hematoma, and fistula), and donor site-complications (i.e., infection, dehiscence, seroma, muscle weakness, and sensory disturbance).

Posteromedial Thigh Flap Dissection Technique

Transverse Design

The patient is placed in supine position with the thigh abducted and the knee flexed. A line is drawn from the perineum to the distal insertion of semitendinosus muscle. This line represents the midline of the adductor magnus muscle, where the perforators of the posteromedial thigh flap arise, usually approximately 8 to 10 cm from the groin crease. A hand-held Doppler probe is used to detect the location of the perforators. For defects with a width of less than or equal to 7 cm and a length of less than or equal to 15 cm, the posteromedial thigh flap can be designed transversely centered on the perforators (Fig. 1). The anterior tip of the flap should not be extended over the anterior margin of the gracilis muscle because the skin territory above it belongs to a different angiosome.¹⁹ The inferior flap margin is incised until the deep fascia is reached and divided. The following two intermuscular septa must be identified: that between the gracilis and the adductor magnus muscle and that between the adductor magnus and the semimembranosus muscle. Thus, a superoanterior incision is performed. The remaining part of the flap is kept intact. Flap elevation is then performed subfascially until the intermuscular septum is reached between the gracilis and the adductor magnus muscle, and septocutaneous perforators can be identified in this septum. If no perforators are detected, the septum is opened and the deep fascia of the adductor magnus muscle is divided to search for musculocutaneous perforators. Care should be taken to look for septocutaneous perforators between the adductor magnus and the semimembranosus muscles. When a sizable perforator is selected, the dissection can proceed in a retrograde fashion. Vascular branches should be ligated carefully during the intramuscular dissection. Pedicle dissection is continued until the desirable length is achieved. Then, the remaining portion of the attached flap is divided. The donor site is closed primarily. (See Video, Supplemental Digital Content 1, which demonstrates the transversely designed posteromedial thigh flap dissection technique, available in the

Table 1. Summary of Posteromedial Thigh Flap Series

Case	Age (yr)	Sex	Diagnosis	Flap Size (cm)	Flap Design	Pedicle Length (cm)	Artery Diameter (mm)	Vein Diameter (mm)	No. of Perforators, Total/Used	Perforator Type	Result	Follow-Up (mo)
1	52	M	Right buccal cancer	15 × 5	T	9	2.2	3.1/2	2/2	MC/SC(AS)	S	7
2	52	M	Left buccal cancer	15 × 6	T	10	2.2	3.8/3.0	2/2	MC/SC(AS)	S	5
3	62	M	Right tongue cancer	18 × 6	T	10	2.1	3.2/2.4	2/2	MC/SC(AS)	S	4
4	70	M	Left hard palate cancer	15 × 7	T	10	2.1	2.6/2.4	1/1	SC(AS)	S	4
5	44	M	Right tongue cancer	15 × 7	T	9	1.8	2.6/2.0	2/1	MC/MC	S	4
6	60	M	Neck contracture	13 × 6	T	10	2.3	3.0/2.6	2/1	MC/MC	S	3
7	47	M	Right oropharyngeal cancer	15 × 6	T	11	2.2	2.6/2.4	1/1	MC	S	3
8	49	M	Left tongue cancer	16 × 7	T	10	2.1	2.5/2.3	2/2	MC/MC	S	3
9	54	M	Hypopharyngeal cancer	17 × 7.5	V	8/10	2.2/2.1	3/2.8	2/2	MC/MC	S	3
10	57	M	Left tongue cancer	20 × 8	V	11	2.3	3.6/3.4	2/1	MC/MC	S	3
11	36	M	Right tongue cancer	20 × 8	V	11	2.2	3.4/2.8	1/1	MC	S	3
12	43	M	Left parotid cancer	15 × 6	T	9	2.1	2.9/2.6	2/2	MC/MC	S	3
13	52	M	Right hard palate cancer	20 × 7	V	13	2.4	3.2/3.0	3/3	MC/MC/MC	S	3
14	47	M	Left buccal cancer	22 × 9	V	12	2.8	3.2/3.0	1/1	SC(GA)	S	2
15	58	M	Right lower gum cancer	15 × 6	T	10	2	2.8/2.2	2/2	MC/SC(AS)	S	2
16	75	M	Right lower gum cancer	16 × 9	T	11	2	3/2.2	1/1	SC(GA)	F	2
17	57	M	Left buccal cancer	17 × 7	T	11	2.2	3/2.4	3/2	MC/MC/SC(AS)	S	2
18	79	M	Right buccal cancer	27 × 7	V	12	2.1	3/2.6	1/1	MC	S	2
19	74	F	Left lower gum cancer	15 × 6	T	10	2	3/2.6	2/2	MC/MC	S	2
20	63	M	Lower lip cancer	18 × 6	V	11	2.2	4/3.1	2/2	MC/MC	S	2
21	59	F	Right tongue cancer	12 × 6	T	8	2.2	2.4/2.0	1/1	SC(AS)	S	2
22	63	M	Hypopharyngeal cancer	15 × 7	T	10	2	3/2.4	2/2	MC/MC	S	2
23	47	M	Right buccal cancer	20 × 8	V	10	2	3/2.0	1/1	MC	S	2

M, male; F, female; T, transverse; V, vertical; MC, musculocutaneous perforator; SC(GA), septocutaneous perforator between gracilis and adductor magnus; SC(AS), septocutaneous perforator between adductor magnus and semimembranosus; S, success; F, failure.

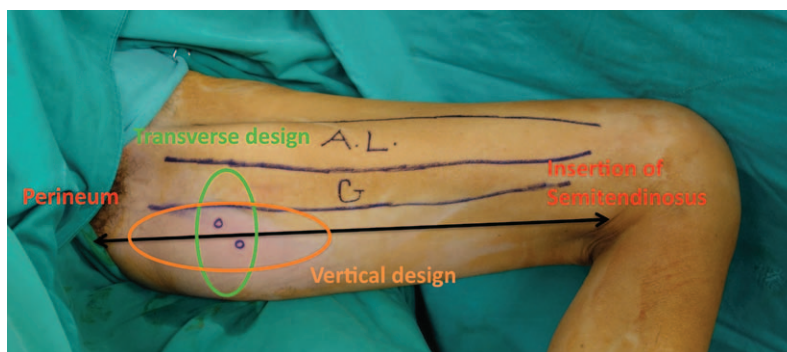


Fig. 1. Positioning the thigh in abduction and the knee flexed to 90 degrees; a reference line is drawn from the perineum to the distal insertion of the semitendinosus muscle. The margins of the adductor longus (AL) and gracilis (G) muscles are also drawn. Most of the perforators are located on the reference line distal to the pubic crease approximately 8 to 10 cm. The posteromedial thigh flap can be designed in transverse (*green*) or vertical (*orange*) fashion.

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Vertical Design

If the defect width is larger than 7 cm or the length is longer than 15 cm, the posteromedial thigh flap is designed in vertical fashion along the reference to achieve primary closure of the donor site and ensure flap perfusion (Fig. 1). An anterior incision is performed first, and the deep fascia over the gracilis muscle is opened to expose the septum on the upper border of the adductor magnus muscle. Here, septocutaneous perforators can be identified. If not, the septum is exposed, and the deep fascia over the adductor magnus muscle is elevated once the

musculocutaneous perforators are identified. Septocutaneous perforators within the septum between the adductor magnus and the semimembranosus muscle should not be omitted. As soon as sizable perforators are selected, retrograde intramuscular dissection can be continued. A posterior incision is performed until the perforator dissection is completed according to defect size. The illustration of the posteromedial thigh flap based on a musculocutaneous perforator from the adductor magnus muscle is provided in Figure 2. (**See Video, Supplemental Digital Content 2**, which demonstrates the vertical designed posteromedial thigh flap dissection technique, available in the “Related Videos” section of the full-text article on PRSJJournal.com or,



Video 1. Supplemental Digital Content 1 demonstrates the transversely designed posteromedial thigh flap dissection technique, available in the “Related Videos” section of the full-text article on PRSJJournal.com or, for Ovid users, available at <http://links.lww.com/PRS/B356>.

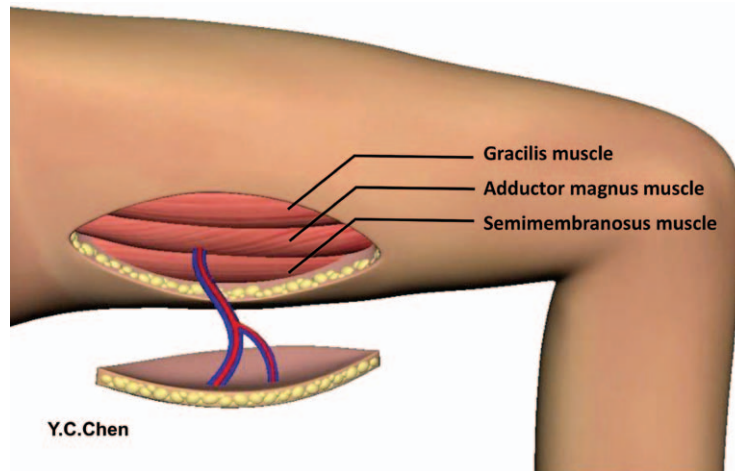


Fig. 2. A posteromedial thigh flap based on musculocutaneous perforators of the adductor magnus muscle.



Video 2. Supplemental Digital Content 2 demonstrates the vertical designed posteromedial thigh flap dissection technique, available in the "Related Videos" section of the full-text article on PRSJournal. com or, for Ovid users, available at <http://links.lww.com/PRS/B357>.

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RESULTS

All flaps were elevated subfascially as perforator-based skin flaps. The average time required to raise the flaps was 92 minutes (range, 66 to 128 minutes). The average size of the flap was 117.6 cm² (range, 12 × 6 cm to 22 × 9 cm). Forty sizable perforators were recorded and were mainly located approximately 8 to 10 cm from the groin crease. Detailed location and the number of perforators is illustrated in Figure 4. The average perforator number was 1.7 (range, one to three). Thirty-six perforators were used.

In four cases, perforators did not join the same pedicle. The relatively small perforators were sacrificed. The following three types of perforator patterns (Fig. 3) were encountered: (1) septocutaneous perforators between the gracilis and the adductor magnus muscle [two of 40 (5 percent)]; (2) musculocutaneous perforators from the adductor magnus muscle [32 of 40 (80 percent)]; and (3) septocutaneous perforators between the adductor magnus and semimembranosus muscle [six of 40 (15 percent)]. The majority of perforators [38 of 40 (95 percent)] originated from the profunda femoris artery, with the exception of two of 40 septocutaneous perforators (5 percent) between the gracilis and the adductor magnus muscle arising from the

medial circumflex femoral artery. The average length of the pedicle was 10.3 cm (range, 8 to 13 cm), and the average diameter of the artery was 2.1 mm (range, 1.8 to 2.8 mm). All pedicles had two concomitant veins. The average diameter of the larger vein was 3 mm (range, 4 to 2.4 mm) and that of the smaller vein was 2.5 mm (range, 3.4 to 2 mm). The flap success rate was 95.6 percent (22 of 23). In one case, the flap failed because of pedicle thrombosis within the first 24 hours, and it was replaced by an anterolateral thigh flap. One case was noted with neck wound infection and was treated with wound care. Flap dehiscence was observed in one patient. The donor site was closed primarily in all cases. Two patients experienced donor-site wound infection and were managed conservatively. No donor-site wound dehiscence or seroma was noted. No patients reported sensory disturbance or muscle weakness. The flap and

donor-site complications are listed in Table 2. The average follow-up period was 3 months (range, 2 to 7 months).

CASE REPORTS

Case 1

A 52-year-old man was diagnosed with right buccal cancer. After resection, the buccal defect measured 6 × 6 cm. Computed tomographic angiography revealed a musculocutaneous perforator from the profunda femoris artery (Fig. 5, *above, left*). A posteromedial thigh flap with transverse design was harvested from the left thigh (Fig. 5, *above, right*) and transferred to reconstruct the defect (Fig. 5, *below, left*). The donor site was closed primarily. Both flap and donor sites healed without complications. The donor-site scar was inconspicuous 3 months after the operation (Fig. 5, *below, right*).

Case 8

A 49-year-old woman was diagnosed with left tongue cancer. Hemiglossectomy with neck dissection was performed and a posteromedial thigh flap with transverse design (Fig. 6, *above*,

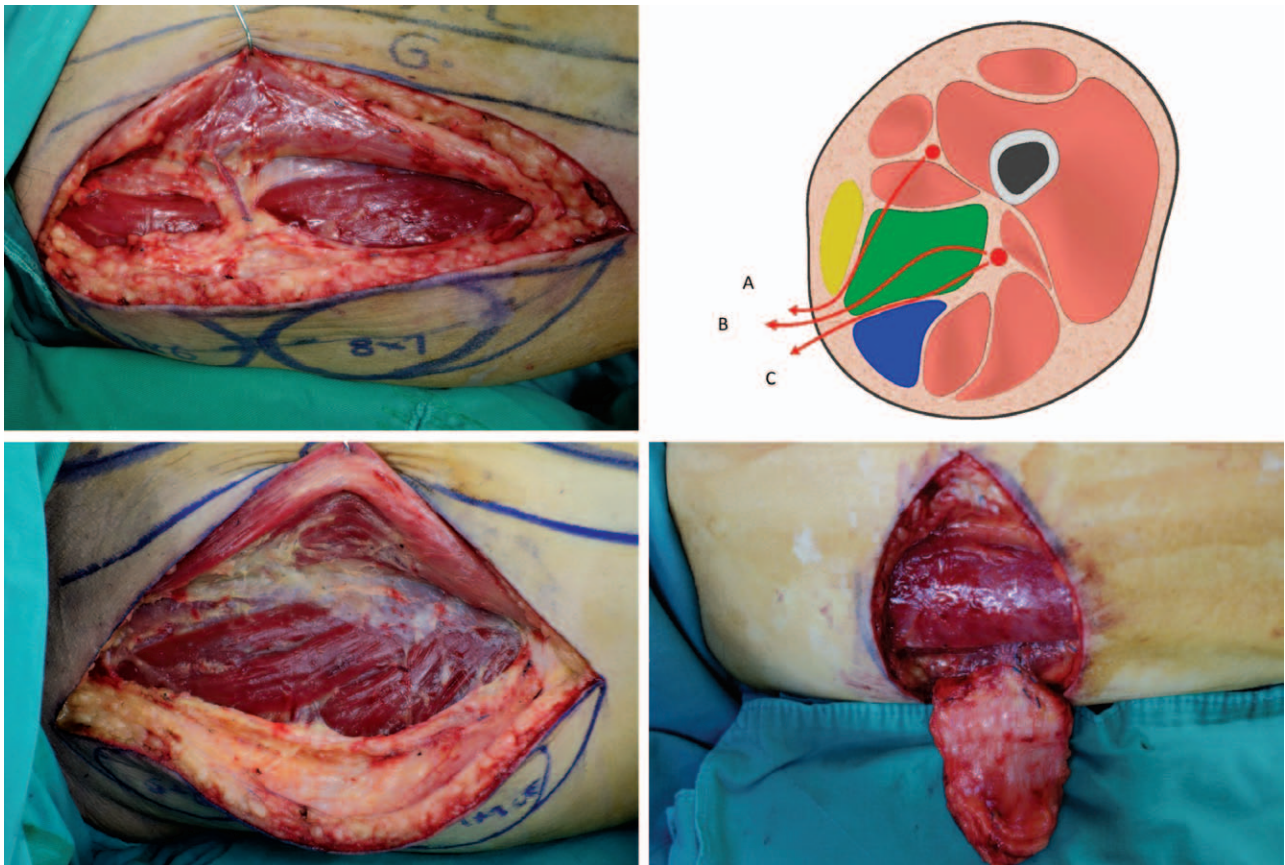


Fig. 3. (*Above, right*) The courses of three types of perforators supplying the posterior medial thigh skin and their relevant anatomy to the gracilis muscle (yellow), the adductor magnus muscle (green), and the semimembranosus muscle (blue). (*Above, left*) (A in *above, right*) Septocutaneous perforators between the gracilis and adductor magnus muscle originated from the medial circumflex femoral artery. (*Below, left*) (B in *above, right*) Musculocutaneous perforators of the adductor magnus muscle originated from the profunda femoris artery). (*Below, right*) (C in *above, right*) Septocutaneous perforators between the adductor magnus and semimembranosus muscles originated from the profunda femoris artery.

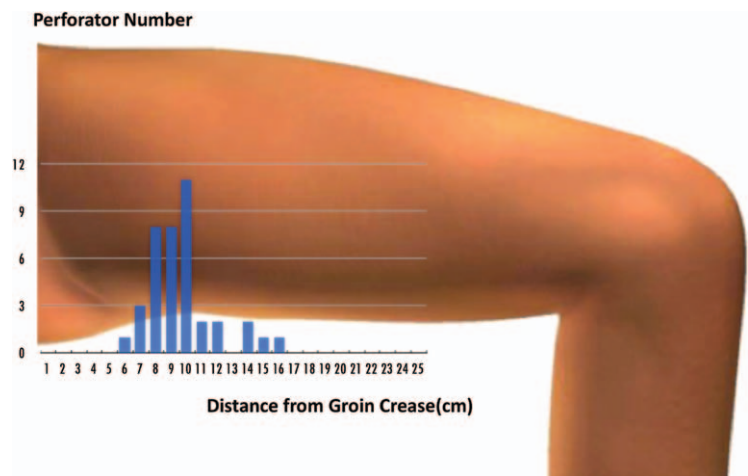


Fig. 4. Distribution of the posterior medial thigh perforators. Most perforators are located approximately 8 to 10 cm from the groin crease. The x axis represents the distance of the perforators from the groin crease. The y axis represents the number of perforators.

Table 2. Summary of Flap and Donor-Site Complications

Complications	No. (%)
Flap related	
Failure	1 (4.3)
Partial necrosis	0 (0)
Infection	1 (4.3)
Dehiscence	1 (4.3)
Hematoma	0 (0)
Fistula	0 (0)
Donor-site related	
Infection	2 (8.7)
Dehiscence	0 (0)
Seroma	0 (0)
Muscle weakness	0 (0)
Sensory disturbance	0 (0)

left) was harvested based on two musculocutaneous perforators. These two perforators joined the same pedicle (Fig. 6, *above, right*). The flap was transferred to reconstruct the hemitongue defect (Fig 6, *below*). The donor site was closed primarily. The postoperative course was uneventful.

Case 9

A 54-year-old man with supraglottic cancer underwent total laryngectomy and bilateral neck dissection, which resulted in a noncircumferential hypopharyngeal defect (Fig. 7, *above, left*). A 17 × 7.5-cm posteromedial thigh flap with vertical design was planned, and two perforators were marked with hand-held Doppler imaging preoperatively. The flap was harvested based on two musculocutaneous perforators (Fig. 7, *above, right*). However, they did not join together when tracing to the profunda femoris artery. To ensure flap viability, two pedicles were included in this flap and anastomosed separately to either side of the superior thyroid arteries and branches of the internal jugular vein (Fig. 7, *below*). The distal skin paddle was brought out for monitoring. The donor-site defect was closed primarily. The postoperative course in this patient was uneventful, without fistula formation.

Case 13

A 66-year-old man was diagnosed with right palate cancer. He received preoperative concurrent chemoradiation therapy. Composite resection was performed, including palate, maxillary wall, and nasal floor (Fig. 8, *above, left*). A chimeric myocutaneous posteromedial thigh flap with vertical design was planned for reconstruction (Fig. 8, *above, right*). During dissection, two skin perforators were identified joining the same pedicle. Therefore, the flap was split into the following two portions: the proximal portion for the nasal floor reconstruction and the distal portion for the palate reconstruction. Moreover, a cube of adductor magnus muscle was included for maxillary sinus obliteration (Fig. 8, *below*). The pedicle was passed through a subcutaneous tunnel and anastomosed to superficial temporal vessels (Fig. 8, *below*). After reconstruction, the contour was satisfactory. The donor site was closed primarily.

DISCUSSION

The posterior thigh skin is perfused by the profunda femoris artery, the superficial femoral artery, and the popliteal artery.²⁰ The dominant blood supply of this anatomical area originates from the profunda femoris artery.²¹ It runs distally and provides at least two perforators (85 percent of cases: three or more perforators) that are distributed evenly between the medial and lateral halves of the thigh.²² The first medial branch, piercing the adductor magnus muscles, provides perforators to nourish the posterior medial skin.²¹ Several cadaveric and image studies have confirmed the reliability and the constant distribution of the medial perforators.^{17,22,23} Haddock et al. reported that they were the most common perforators (present in 85.6 percent of thighs) according to computed tomographic angiography and magnetic

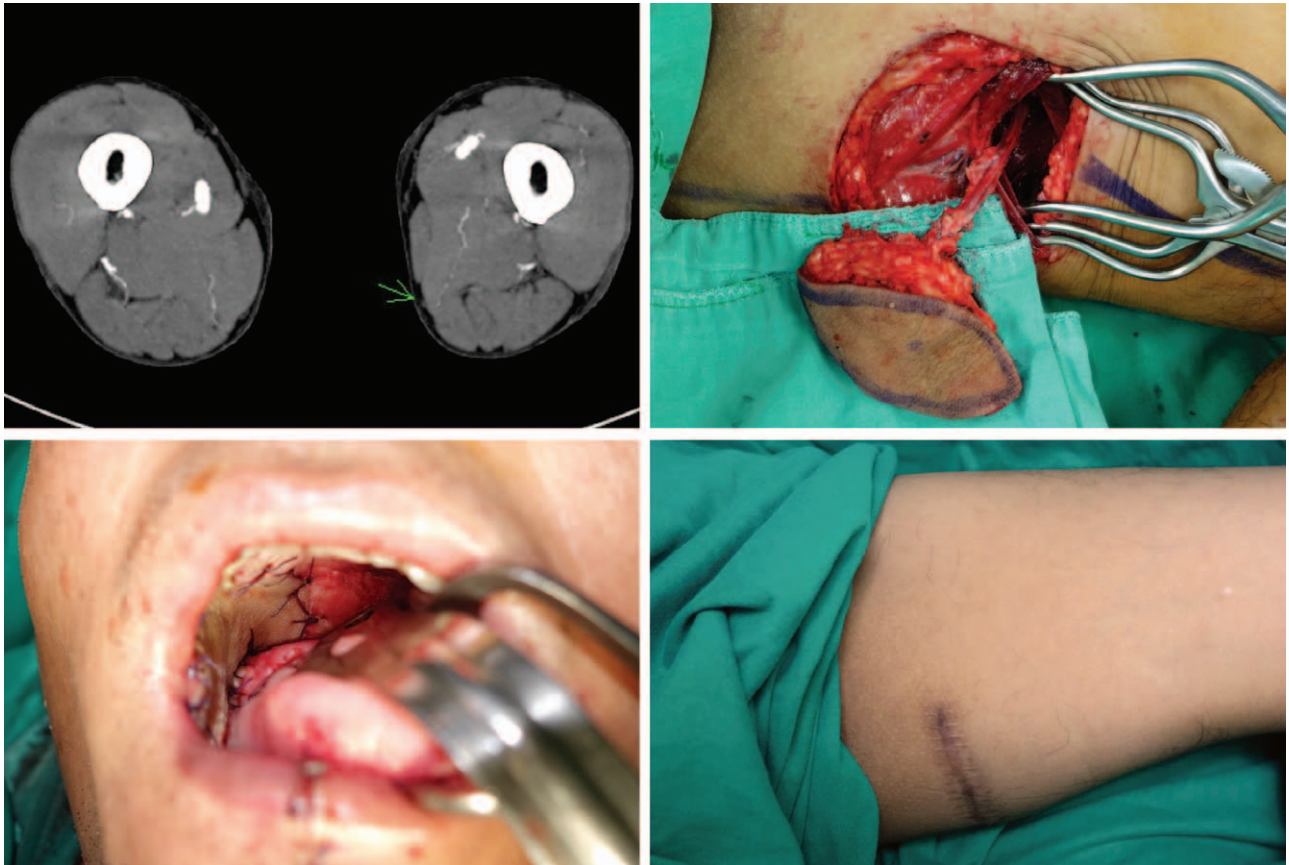


Fig. 5. Computed tomographic angiography revealed a musculocutaneous perforator from the profunda femoris artery (*above, left*). A posteromedial thigh flap was dissected based on one musculocutaneous perforator (*above, right*). The flap was transferred to reconstruct a right buccal defect (*below, left*). The donor-site scar 3 months after surgery (*below, right*).

resonance angiography and that their location was near the adductor magnus at 3.8 cm from the midline and 5.0 cm below the gluteal fold.²³ Saad et al. performed a cadaveric study and reported that the average pedicle length of the medial perforator was 10.6 cm, with average artery and vein diameters of 2.3 mm and 2.8 mm, respectively.¹⁷ However, the positional changes required during the operation are the main drawback for perforator flaps from the posterior medial thigh. Thus, the early clinical applications of this flap were for ischial pressure sore reconstruction.^{12–15} Later, Allen et al. reported the first use of the profunda artery perforator flap for breast reconstruction.¹⁶ Initially, the flap harvesting was performed in the prone position, and a supine “frog-leg” position was later adopted to eliminate the need for repositioning. Recently, Satake et al. reported the free posterior medial thigh perforator flap for breast reconstruction in women with a small to moderate breast size.¹⁸ Inspired by their innovative work, the authors modified the flap design

without including the skin of the posterior thigh below the gluteal fold and subsequently applied it to head and neck reconstruction.

In this study, we discovered some new points regarding the origin and patterns of perforators and compared them with previous studies. Approximately 95 percent of the posterior medial thigh perforators originated from the profunda femoris artery, and the remaining 5 percent arose directly from the medial circumflex femoral artery. There were three types of perforator patterns: septocutaneous perforator between the gracilis and the adductor magnus muscle, musculocutaneous perforator from the adductor magnus muscle, and septocutaneous perforator between the adductor magnus and the semimembranosus muscle. In our series, we found two septocutaneous perforators originating from the medial circumflex femoral artery between the gracilis and the adductor magnus muscle, whereas the other perforators originated from the profunda femoris artery. Therefore, according to the “Gent” consensus on perforator flap terminology, we decided to name

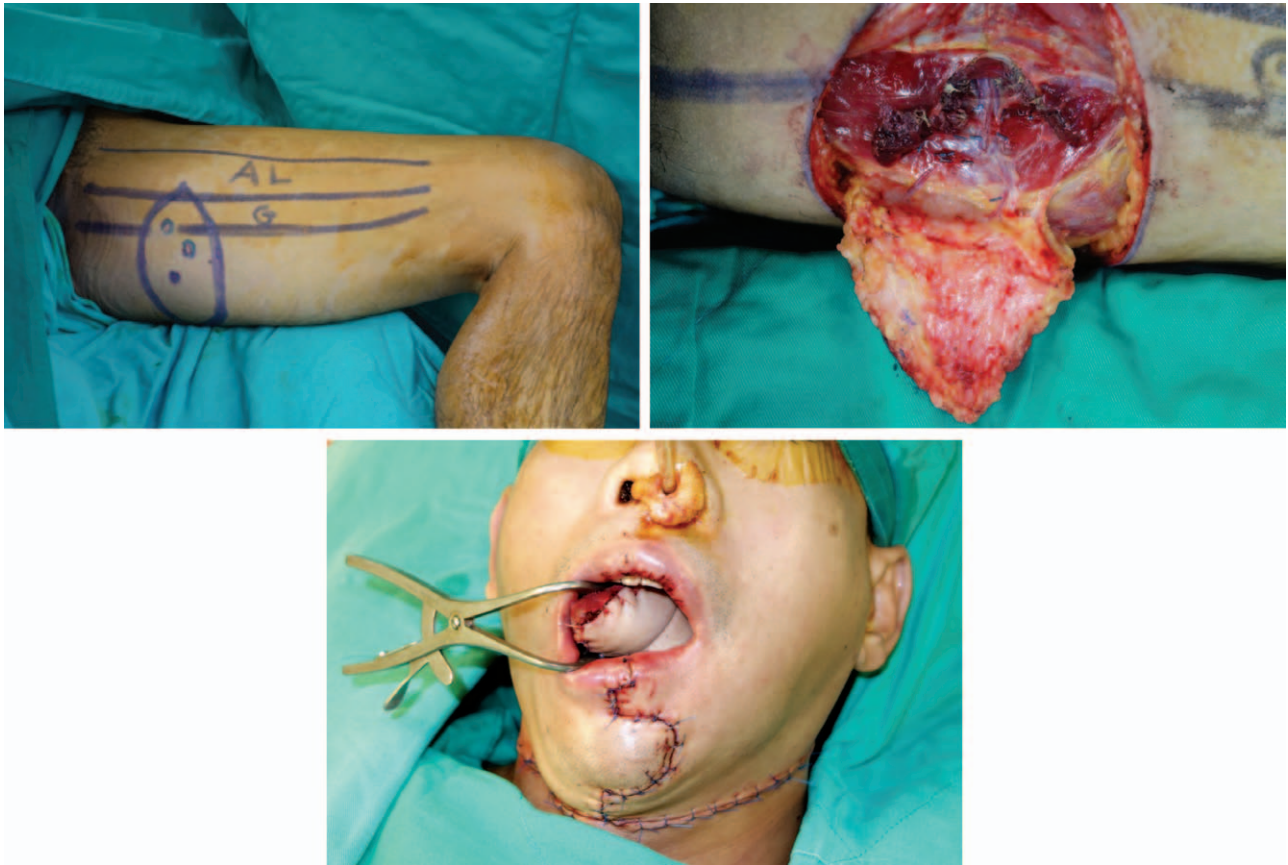


Fig. 6. Transverse design of a posteromedial thigh flap (*above, left*). Two separate musculocutaneous perforators from the same pedicle (*above, right*). The posteromedial thigh flap was transferred to reconstruct a hemiglossectomy defect (*below*).

the flap the posteromedial thigh flap based on its anatomical skin region, indicating that not all perforators were from the profunda femoris artery.²⁴

In our findings, the majority [32 of 40 (80 percent)] of the perforators were musculocutaneous, and eight of 40 (20 percent) were septocutaneous, which is consistent with the report by Angrigiani et al.¹² Although the high incidence of musculocutaneous perforators could increase the difficulty of posteromedial thigh flap dissection, a longer pedicle length could be obtained with intramuscular dissection. In our study, the average pedicle length was 10.3 cm (range, 8 to 13 cm) and was always sufficient to reach the recipient vessels in head and neck reconstruction. No vein grafting was required in this series.

An average of 1.7 sizable perforators (range, one to three) was recorded during our dissections. None of the cases lacked sizable perforators. At the beginning of the study, computed tomographic angiography was planned to define the number and location of the perforators and was performed in seven patients. We observed that the perforators were consistently located

approximately 8 to 10 cm from the groin crease (Fig. 4). This finding had already been supported and enhanced by the study by DeLong et al.²² Therefore, routine preoperative evaluation of the perforators by computed tomographic angiography was not suggested and is not performed anymore, unless a special flap design (double skin paddle) is indicated.

The posteromedial thigh flap was performed with the following two different designs: transverse and vertical. The transverse design can be used to reconstruct small to moderate defects, including buccal, oropharyngeal, palate, partial tongue, and hemitongue defects. The conventional workhorse flaps for reconstruction of the above defects are the radial forearm flap and the ulnar artery perforator flap. However, donor-site morbidities are the main concern.^{25,26} The superoposterior portion of the flap was routinely kept attached to the skin during perforator dissection; therefore, if no sizable perforator was found or the perforator was injured during the dissection, the flap could be repositioned. The donor-site scar is very well hidden by the

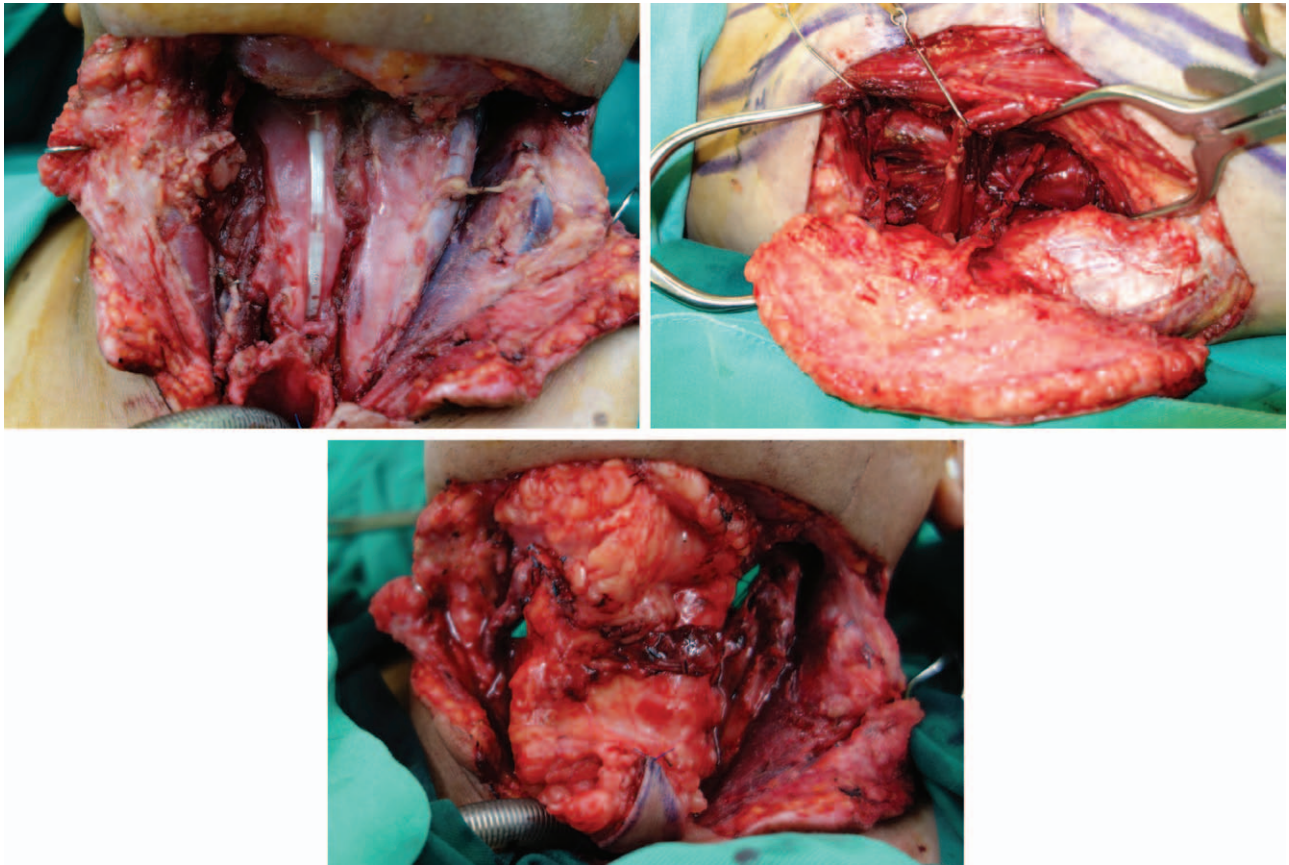


Fig. 7. A noncircumferential hypopharyngeal defect (*above, left*). A vertical design posteromedial thigh flap was harvested based on two different pedicles (*above, right*). The flap was transferred to reconstruct the defect. Four anastomoses were performed bilaterally on the neck. The distal portion of the flap was turned outside for monitoring (*below*).

transverse design. If a larger flap was required, the design was switched to the vertical fashion. We performed an anterior incision first and kept the posterior part of the flap attached during the perforator dissection. This procedure has the following two advantages: (1) the flap harvesting could start simultaneously with the cancer resection to save operative time, and the posterior portion of the flap could be divided according to defect size; and (2) in case no sizable perforator was found or the perforator was damaged, the flap could be reattached. The vertical design allows transfer of larger soft-tissue flaps than the transverse design and is indicated for moderate to large defects, including total glossectomy, through-and-through buccal defects, and hypopharyngeal defects. When a complex flap design is needed, such as flap splitting or a chimeric flap, the vertical design is also preferred.

In the cadaver dissection study performed by Hurwitz et al., an injection of barium contrast solution into the proximal profunda femoris artery perforator and consequent computed

tomographic angiography confirmed a perfused skin flap of approximately 27×17 cm.¹³ The largest flap in this study was 22×9 cm, which is usually sufficient for reconstructing the majority of head and neck defects. When dead space is encountered, various sizes of adductor magnus muscle, nourished by profunda femoris perforators, can be incorporated in the flap for obliteration. Although the adductor magnus muscle is attached to the main pedicle, resulting in fewer degrees of freedom, we did not encounter any difficulties during flap inset. If the perforators originate from the medial circumflex femoral artery, the gracilis muscle can be included. Hurwitz et al. reported that the first medial branch of the profunda femoris artery consistently provides two separate perforators.¹³ This finding indicated that the posteromedial thigh flap could potentially be divided to reconstruct defects involving different anatomical areas (Fig. 8). In addition, the skin of the posterior medial thigh is less hairy, and a better aesthetic outcome can be achieved with facial and intraoral reconstruction.

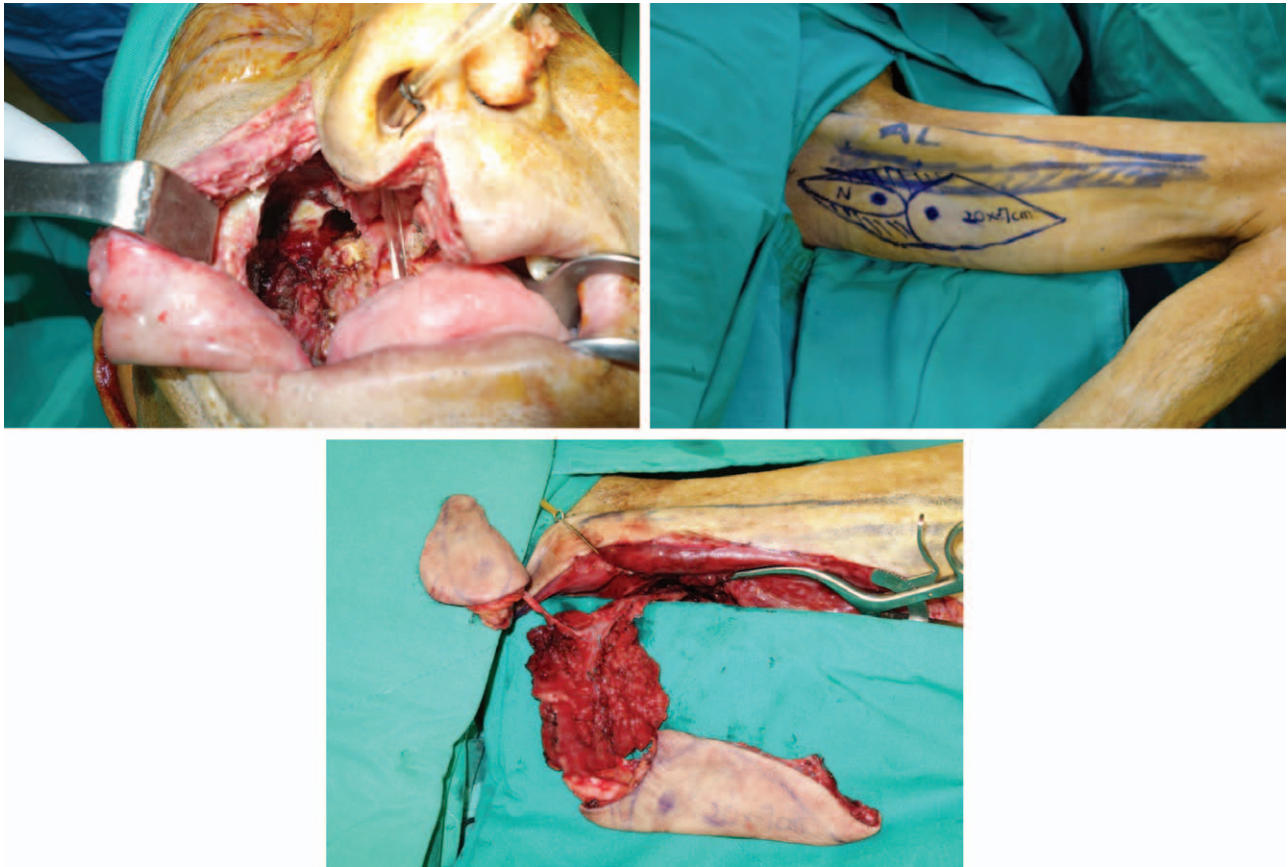


Fig. 8. A right palatal defect with communications to the maxillary sinus and to the nasal cavity (*above, left*). A vertical design posteromedial thigh flap (*above, left*). The flap was divided into two portions: the proximal portion for the nasal defect reconstruction and the distal portion for the palatal defect reconstruction. A cube of adductor magnus muscle was included for maxillary sinus obliteration (*below*). The pedicle was passed through a subcutaneous tunnel and anastomosed to the superficial temporal artery (*below*).

A minor disadvantage of the posteromedial thigh flap compared with the anterolateral thigh flap is that the deep fascia overlying the medial compartment muscle of the thigh is thin and is unable to provide enough strength for an oral sling. Therefore, if required, the plantaris tendon could be harvested from the same leg. Moreover, in obese patients, the posteromedial thigh flap might be too thick for shallow defects, and primary or secondary debulking procedures are required.

The advantages of the posteromedial thigh flap compared with conventional flaps (*i.e.*, anterolateral thigh, anteromedial thigh, medial sural artery perforator, and proximal lateral leg flaps) from the lower extremity (Table 3) include the following. First, with regard to pedicle length, we achieved lengths of up to 10 cm, and the pedicle length of the anterolateral thigh and medial sural artery perforator flaps can also be more than 10 cm. The anteromedial thigh flap has inconsistent pedicle length. The proximal lateral leg flap

has the shortest pedicle length. Second, regarding the pedicle diameter, all flaps have a diameter of approximately 2 mm and are suitable for microvascular anastomosis, except for the anteromedial thigh flap from the superficial femoral artery. Third, regarding donor-site closure, the medial sural artery perforator flap and the proximal lateral leg flap require a skin graft if the flap width is greater than 6 cm. In contrast, flaps from the thigh region allow for a larger flap width (up to 9 cm) for primary closure. Fourth, the donor-site scar is visible in the medial sural artery perforator and proximal lateral leg flaps. The posteromedial thigh flap can best conceal the donor site. Fifth, the anterolateral thigh flap has the greatest versatility among all flaps: various soft-tissue components (*i.e.*, skin, subcutaneous tissue, fascia, muscle, and nerve) can be incorporated into the flap for composite reconstructions. The medial sural artery perforator flap can include the gastrocnemius muscle, and the plantaris tendon can

Table 3. Comparison of the Posteromedial Thigh, Anterolateral Thigh, Anteromedial Thigh, Medial Sural Artery Perforator, and Proximal Lateral Leg Flaps

	Posteromedial Thigh Flap	Anterolateral Thigh Flap	Anteromedial Thigh Flap	Medial Sural Artery Perforator Flap	Proximal Lateral Leg Flap
Pedicle*	Profunda femoris artery	Descending branch of LCFA	RFB or SFA	Medial sural artery	Perforator of peroneal artery
Pedicle length, cm	10.7 (8–13)†	12 (8–16)‡	RFB: 7–15§ SFA: 3–5§	12.7 (9–16)¶	6.96 (4.5–10)¶¶
Pedicle caliber, mm	2.1 (1.8–2.3)†	2.1 (2.0–2.5)‡	RFB: similar to ALT§ SFA: 1–1.5§	1–2¶	1.96 (1.5–2.3)¶¶
Maximal flap width to allow primary closure	9	10	8	6	6
Chimeric flap	Adductor magnus muscle, gracilis muscle	Vastus lateralis muscle, rectus femoris muscle, and tensor fascia lata	Rectus femoris muscle	Medial gastrocnemius muscle	Soleus muscle

LCFA, lateral circumflex femoral artery; RFB, rectus femoris branch; SFA, superficial femoral artery.

*Most common source of pedicle.

†From our series.

‡From Wei FC, Mardini S. *Flaps and Reconstructive Surgery*. Philadelphia: Saunders/Elsevier; 2009.

§ From Yu P, Selber J. Perforator patterns of the anteromedial thigh flap. *Plast Reconstr Surg*. 2011;128:151e–157e.

¶From Kao HK, Chang KP, Chen YA, Wei FC, Cheng MH. Anatomical basis and versatile application of the free medial sural artery perforator flap for head and neck reconstruction. *Plast Reconstr Surg*. 2010;125:1135–1145.

¶¶From Chang CC, Huang WC, Lin JY, Lin YC, Wang WH, Wei FC. Perforator flap from proximal lateral leg for head and neck reconstruction. *J Reconstr Microsurg*. 2013;29:263–270.

be harvested from the same wound. The anteromedial thigh flap and the proximal lateral leg flap are often used as fasciocutaneous flaps. Compared with the above flaps, the posteromedial thigh flap can be elevated either with the adductor magnus or the gracilis muscle as a chimeric flap. In addition, flap splitting is possible for reconstructing different anatomical defects.

CONCLUSIONS

The posteromedial thigh flap is an excellent option for head and neck reconstruction. The location of the perforators is consistent, and the pedicle is long and reliable. Various components of soft tissue can be incorporated into the flap to achieve the demands of the reconstruction. The donor-site scar is well concealed and presents minimal morbidity.

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